JPL Air Quality and Health
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Project Team: Daniel Cusworth, Kevin O'Connell, Melissa Traverso

EXT. Los Angeles – DAY

Shots of the City: Metro, Refineries, Emission, etc. Stock Footage

DANIEL
Los Angeles ranks 2nd out of 20 cities in the United States as a top contributor of carbon dioxide, emitting roughly 19 million tonnes of carbon per year. Changes in climate due to elevated greenhouse gas emissions can potentially have an effect on human health.

Title: Detecting Policy Relevant Greenhouse Gas Emission Reduction Scenarios for Los Angeles Utilizing Current and Future Remote Sensing Capabilities

INT. JPL OFFICE

Images of signing of different legislation. Right of screen: No sat. top down monitoring system exists.

MELISSA
In recent years, there has been much deliberation and debate over greenhouse gas emission reduction on both regional and global scales. In 2006, California passed AB 32, a landmark piece of legislation that effectively mandated the state to decrease GHG emission to 1990 levels by the year 2020. Key to the success of this legislation is an effective policy-monitoring tool. Currently, no policy monitoring strategies incorporate remote sensing or satellite information.

EXT. SPACE – OCO-2 Animation

TITLE: Project Objective: Create TOP-DOWN Policy Monitoring tool for OCO-2

MELISSA
The objective of this project was to create an effective top down CO_2 monitoring tool, specifically aimed for the launch of the Orbiting Carbon Observatory satellite, or OCO-2, which is scheduled to launch in 2013.

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DANIEL
What type of data does OCO-2 provide us with? OCO-2 measures XCO_2 or column-averaged CO_2 concentrations along its flight path. It provides a singular value in parts per million. Atmospheric carbon dioxide concentrations are affected by several factors including winds,

background conditions, and anthropogenic sources. So without further information about these sources, we can't attribute them to an XCO2 value in a meaningful way.

INT. JPL Hall/Outside – Day

KEVIN
In order to create this link, we had to start with an emissions inventory. This was provided by the Vulcan Project, out of Arizona State University. Emission data is given for eight sectors for the entire United States on an hourly timescale.

On Screen appears text with eight Vulcan sectors

INT. JPL Hall/Outside – DAY

KEVIN
To link emissions to observations, a transport model is necessary. We used STILT, which is a langrangian particle dispersion model, based off of Hysplit. The model computes trajectories for a given observational framework. Once we have trajectories, we convolve them with emissions to arrive at modeled XCO2 values

INT. JPL OFFICE- Project Methodology

Image of Project Methodology

Image of Google Earth OCO-2 flight path

DANIEL
To do this, we used the following methodology: First, we asked ourselves – where will OCO-2 someday take measurements? We set these points as receptor locations to input into our model.

Zoom into computer screen. Show timesname file.

DANIEL
We sent these locations to STILT, which through the help of a supercomputer computes particle trajectories. Simply put. This enables us to link Vulcan emissions data to our specific receptor locations.

DANIEL
After convolving emissions with particle trajectories, we arrive at our desired value – modeled XCO2 enhancements due to anthropogenic sources. We can use these values to compare to future OCO-2 data.

INT. OFFICE (40s)

MELISSA
This methodology equips us with the ability to start asking interesting and policy driven question, such as, what types of policy driven carbon reductions have the potential to be seen and monitored by OCO-2? We first started with AB 32. California is mandated to reduce emissions to 1990 by the year 2020. Using data provided by the state, we found this to be an effective 11% percent total emission reduction. For our model, we assumed that this 11% reduction would occur uniformly across all sectors.

MELISSA
After modeling this scenario, we see visible changes, especially at certain observation points. Given certain background factors and the error range of OCO-2, this is how we would expect OCO-2 to observe such a change.

EXT. UNION STATION - DAY

KEVIN
Here we are outside of Union Station, the center of LA's Subway System. Los Angeles currently is expanding its Metro lines and is scheduled to be finished by 2022. The LA Metro Transit Authority reports that each new mile of subway line will translate to carbon emission reductions. For our study, we found the locations and distances where the metro is expanding, and found what the effective cut in CO2 will be for that region.

Animation of metro expansion. B-Roll of sped up metro expansion along freeway.

KEVIN
Comparing the XCO2 values for each observational point, we can't discern any significant changes. This leads

INT. OFFICE –DAY

DANIEL
Our preliminary work leads us to several conclusions. We see that OCO-2 has a certain limit to which policies it can detect. Obviously this limit is dependent on the magnitude and geographic location of the emission reduction.

INT. OFFICE - DAY

KEVIN
This led us to poke at some different questions such as - How does the modeled XCO2 change if we translate our OCO-2 path geographically? Of course, OCO-2 is going to always fly over the same path in the basin, but this theoretical question gets at the question of spatial density of

XCO2. We simulated two different XCO2 paths for this purpose, and applied the same reduction scenarios to them. We see that depending on the path, XCO2 values change differently.

INT. OFFICE - DAY

MELISSA
The California Air Resources Board was mandated by State to develop a plan so that California would be able to comply with the provisions of AB32. Transitioning our findings to CARB will provide them with an avenue to monitor the progress of the State's carbon reductions. We have also been in contact with UCLA's Institute of the Environment and Sustainability for the purpose of identifying already implemented or planned city and statewide carbon reduction policy, which has helped to guide our modeling scenarios.

EXT. JPL – DAY

MELISSA
Reducing carbon emissions, especially in the industrial and vehicle heavy city of Los Angeles is a formidable task. Monitoring these reductions is also difficult, but with the help of the OCO-2 satellite, with proper emissions inventories and transport models, we are one step closer to making progress on the issue.

The End

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Music:
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"Groove Grove"
Kevin MacLeod